

WHAT IS CLAIMED IS:

1. An electro-kinetic transporter-conditioner, comprising:

a housing;

5 a first electrode array including at least one wire-like electrode, disposed in said housing;

a second electrode array, removably disposed in said housing, having a base member and including at least two electrodes disposed substantially parallel to said wire-like electrode in said first electrode array, said wire-like electrode in said first electrode array being equidistant from said two electrodes

10 in said second electrode array;

a source of high voltage outputting a signal whose duty cycle may be varied from about 10% to about 100%, disposed in said housing, coupled between said first electrode array and said second electrode array; and

15 means, attached to said base member, for frictionally cleaning said wire-like electrode whenever said base member of said second electrode array is moved within said housing.

2. The electro-kinetic transporter-conditioner of claim 1, wherein said

means for frictionally cleaning includes a strip of flexible electrically insulating material having a first end attached to said base member, and having a second end that defines a slit;

said strip extending from said base toward and beyond said first electrode array such that said wire-like electrode fits frictionally within said slit when said second electrode array is disposed in said housing.

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3. The electro-kinetic transporter-conditioner of claim 2, wherein said strip has at least one characteristic selected from a group consisting of (a) said strip includes Mylar, (b) said strip includes Kapton, (c) said strip has a strip thickness of about 0.1 mm, (d) slit has a slit length of at least 0.25", and (e) said slit has a slit width less than a thickness of said wire-like electrode.

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4. The electro-kinetic transporter-conditioner of claim 2, wherein an inside bottom surface of said housing includes an upwardly projecting vane disposed to deflect said second end of said strip upwardly and away from said wire-like electrode when said second electrode array is fully disposed in said housing.

5. The electro-kinetic transporter-conditioner of claim 1, wherein said means for frictionally cleaning includes:

an arm, made of an electrically insulating material, having a first distal end and a second end that is biasedly pivotably attached to said base;

5 a strip of flexible electrically insulating material having a first end attached to said first distal end of said arm, and having a second end that defines a slit;

said arm and said strip extending from said base toward and beyond said first electrode array such that said wire-like electrode fits frictionally within said slit when said second electrode array is disposed in said housing.

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6. The electro-kinetic transporter-conditioner of claim 5, wherein said strip has at least one characteristic selected from a group consisting of (a) said strip includes Mylar, (b) said strip includes Kapton, (c) said strip has a strip thickness of about 0.1 mm, (d) said slit has a slit length of at least 0.25", and (e) 15 said slit has a slit width less than a thickness of said wire-like electrode.

7. The electro-kinetic transporter-conditioner of claim 6, wherein said arm is pivotably biased towards an angle of about 90° relative to a longitudinal axis of said second electrode array.

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8. The electro-kinetic transporter-conditioner of claim 5, wherein an inside bottom portion of said housing includes an upwardly projecting vane disposed to deflect said first distal end of said arm upwardly and away from said wire-like electrode when said second electrode array is fully disposed in said 25 housing.

9. The electro-kinetic transporter-conditioner of claim 8, wherein:  
said base of said second electrode array includes a downwardly projecting member;

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said inside bottom portion of said housing defines an opening sized to receive said projecting member of said base when said second electrode array is fully inserted into said housing;

wherein said arm and said strip attached thereto are pivoted upward and parallel to a longitudinal axis of said second electrode array.

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10. The electro-kinetic transporter-conditioner of claim 2, wherein:  
said first electrode array includes a plurality of wire-like electrodes; and

said strip defines a plurality of slits, one of said slits being disposed to frictionally engage one of said wire-like electrodes in said first electrode array.

5        11. The electro-kinetic transporter-conditioner of claim 4, further including a barrier wall mounted on said inside bottom surface, said barrier wall disposed between a bottommost portion of said first array and a bottommost portion of said second array.

10      12. The electro-kinetic transporter-conditioner of claim 1, further including a bead having a through opening, disposed such that said wire-like electrode passes through said through opening;

15      wherein friction between an inner surface of said through opening and an exterior surface of said wire-like electrode can clean said exterior surface of said wire-like electrode.

15      13. An electrode cleaner for use with an electro-kinetic transporter-conditioner that includes a first electrode array including at least one wire-like electrode, and a removable second electrode array having a base member and including at least two electrodes disposed substantially parallel to said wire-like electrode in said first electrode array, the electrode cleaner comprising:

20      a strip of flexible electrically insulating material having a first end attached to said base member, and having a second end that defines a slit;

25      said strip extending from said base toward and beyond said first electrode array such that said wire-like electrode fits frictionally within said slit when said second electrode array is disposed for operation of said electro-kinetic transporter-conditioner;

30      wherein movement of said base member causes said slit in said strip to frictionally clean an outer surface of said wire-like electrode.

30      14. The electrode cleaner of claim 13, further including:

35      means for deflecting at least the slit-containing end of said strip into a position parallel to a longitudinal axis of said wire-like electrode when said electro-kinetic transporter-conditioner is in operation.

35      15. The electrode cleaner of claim 14, wherein said means for deflecting includes a vane disposed within said transporter-conditioner such that

during operation of said transporter-conditioner a distal portion of said vane contacts and so deflects said slit-containing end of said strip.

16. The electrode cleaner of claim 14, wherein said means for  
5 deflecting includes a biased pivot mechanism that attaches said strip to a base  
of said second electrode array.

17. An electro-kinetic transporter-conditioner, comprising:  
a housing;  
10 a first electrode array including at least one wire-like electrode, disposed  
in said housing;  
a second electrode array, removably disposed in said housing, having a  
base member and including at least two electrodes disposed substantially  
15 parallel to said wire-like electrode in said first electrode array, said wire-like  
electrode in said first electrode array being equidistant from said two electrodes  
in said second electrode array;  
a source of high voltage, disposed in said housing, coupled between said  
first electrode array and said second electrode array; and  
at least one bead-like member defining a through opening;  
20 wherein said wire-like electrode passes through said through opening and  
an outer surface of said wire-like electrode may be at least partially frictionally  
cleaned by movement of said bead-like member along a length of said wire-like  
electrode.

25 18. The electro-kinetic transporter-conditioner of claim 17, wherein said  
through opening has a characteristic selected from a group consisting of (a) said  
through opening is formed through a geometric center of said bead-like member,  
(b) said through opening is formed parallel to but offset from a longitudinal axis  
of said bead-like member, (c) said through opening is formed offset from at  
30 inclined relative to a longitudinal axis of said bead-like member, (d) a cross-  
section of said through opening is circular, and (e) a cross-section of said  
through opening is non-circular.

35 19. The electro-kinetic transporter-conditioner of claim 17, wherein a  
diameter of said through opening exceeds a diameter of said wire-like electrode  
by at least 0.5 mm.

20. The electro-kinetic transporter-conditioner of claim 17, wherein:  
a bottom end of said wire-like electrode is retained in a pylon; and  
said bead-like member is bell-shaped such that when in a bottommost  
position along said wire-like electrode, an air gap exists between an outer  
5 surface of said wire-like electrode and an inner surface of said bead-like  
member.

21. A method for cleaning a wire-like electrode in an electro-kinetic  
transporter-conditioner of the type having a housing in which are disposed a  
10 first electrode array including at least one wire-like electrode, and a second  
electrode array, removably disposed in said housing, having a base member and  
including at least two electrodes disposed substantially parallel to said wire-like  
electrode in said first electrode array, said wire-like electrode in said first  
electrode array being equidistant from said two electrodes in said second  
15 electrode array, and a source of high voltage outputting a signal whose duty  
cycle may be varied from about 10% to about 100%, disposed in said housing,  
coupled between said first electrode array and said second electrode array;

the method including the following steps:

disposing within said housing a mechanism to frictionally clean said wire-  
like electrode when at least one of the follow actions occurs:  
20 said base member of said second electrode array is moved; or  
said transporter-conditioner is turned upside down and rightside up.

22. The method of claim 21, wherein disposing said mechanism  
25 includes attaching a first end of a strip of flexible high voltage tolerant material  
to said base, a second end of said strip defining a slit sized to frictionally engage  
said wire-like electrode, said strip extending toward and beyond said wire-like  
electrode;

30 wherein said strip is disposed such that when said second electrode array  
is inserted in said housing said wire-like electrode fits within said slit;  
wherein movement of said strip frictionally cleans an outer surface of said  
wire-like electrode.

35 23. The method of claim 21, further including:  
urging said second end of strip upward and away from said wire-like  
electrode when said second array is fuller inserted in said housing.

24. The method of claim 23, wherein urging includes disposing a vane projecting from an interior region of said housing such that a distal end of said vane contacts said strip and urges said second end upward and away from said wire-like electrode.

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25. The method of claim 21, wherein disposing said mechanism includes pivotally and biasedly attaching a first end of an arm to said base, and attaching to a second end of said arm a strip of flexible high voltage tolerant material whose distal end defines a slit sized to frictionally engage said wire-like electrode, said strip extending toward and beyond said wire-like electrode;

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wherein said strip is disposed such that when said second electrode array is inserted in said housing said wire-like electrode fits within said slit;

wherein movement of said strip frictionally cleans an outer surface of said wire-like electrode.

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26. The method of claim 21, wherein disposing said mechanism includes providing a bead-like member having a through opening through which said wire-like electrode passes;

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wherein when said transporter-conditioner is inverted, said bead-like member moves along a length of said wire-like member and frictionally cleans an outer surface of said wire-like member.

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27. The method of claim 26, further including forming said through opening with a characteristic selected from a group consisting of (a) said through opening is formed through a geometric center of said bead-like member, (b) said through opening is formed parallel to but offset from a longitudinal axis of said bead-like member, (c) said through opening is formed offset from at inclined relative to a longitudinal axis of said bead-like member, (d) a cross-section of said through opening is circular, and (e) a cross-section of said through opening is non-circular.

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28. The method of claim 26, wherein a bottom end of said wire-like electrode is retained in a pylon; and

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disposing said mechanism includes providing a bell-shaped bead-like member having a through-opening through which said wire-like member passed;

wherein when in a bottommost position along said wire-like electrode, an air gap exists between an outer surface of said wire-like electrode and an inner surface of said bead-like member.

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